Ceramic Fibre Insulation: The Whole Story

With the advancement of technology as well as continuously increasing energy costs, there has been always a demand for new and more dependable insulating materials. Developed initially by NASA in the 1950s, ceramic fibre insulation has gained wider and wider use in various heat related industries. These insulating products are very light and highly porous resulting in excellent insulating efficiency. Use of such materials reduces the overall weight of the structure, reduces energy consumption and increases productivity by reducing cooling times.

Thermal Efficiency

Dr A. Joardar in his recent article “How effective are Insulating Refractory (Ceramic) Fibers” \(^1\) compared the relative energy requirement for three different types of Kiln wall insulation.

The table below shows the findings.

<table>
<thead>
<tr>
<th>Wall Construction</th>
<th>Heat Loss (BTU /ft(^2) /hr)</th>
<th>Heat Storage (BTU /ft(^2))</th>
<th>Cold Face (Deg C)</th>
<th>Lining Weight (lbs /ft(^2))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A Fireclay Brick Insulation</td>
<td>1239</td>
<td>23400</td>
<td>218</td>
<td>98</td>
</tr>
<tr>
<td>Type B Ceramic Fiber Board Insulation</td>
<td>201</td>
<td>4603</td>
<td>80</td>
<td>22</td>
</tr>
<tr>
<td>Type C Ceramic Fiber Board (1 Layer, 2 layer Fiber Blanket) Insulation</td>
<td>220</td>
<td>1546</td>
<td>83</td>
<td>5.75</td>
</tr>
</tbody>
</table>

Type A shows a brick only insulation construction, Type B and Ceramic Fiber Board type of construction, Type C is a Ceramic Fiber Board with Ceramic Fiber Blanket backup type of construction. All Types of construction have the same overall thickness. Column 1 shows the amount of energy lost by area per hours. Column 2 the amount of energy absorbed by the insulation by area, Column 3 the relative temp of the rear of the insulation and Column D the relative weight of the lining material by area.

As you can see the relative heat loss and energy stored is huge comparing brick insulation with ceramic fiber. The heat loss shows the energy that is simply lost through the insulation as the kiln heats up. The heat storage is the amount of energy that is absorbed into the brick. This may sound like a good thing, but what it means is the amount of energy absorbed into the bricks themselves rather than used in heating the air and ware inside the Kiln itself. This all represents wasted energy and will result in higher running costs. The amount on energy absorbed into the bricks also means that the kiln has a lot more energy to shed when cooling and thus takes a longer time to cool.
From this example alone you can see what we mean when we say “Woodrow Kilns prides itself on offering the most up to date advances in Kiln design and materials”. A Woodrow Kiln will generally use less power to get to temperature and is better able to shed that heat once it begins to cool. If you couple this with our Standard Automatic Multi-stage temperature controller you have a Kiln that is both efficient and flexible to cover almost any type of firing you wish to achieve.

Woodrow employs the Type C construction methodology. A Pre-shrunk Ceramic Fiber Board with multiple layers (3) of backup Fiber Blanket insulation.

**Heath Concerns**

Ceramic Fiber insulation must not be confused with insulation that once used asbestos as a component. As a legacy of the lessons learned from the Asbestos problem there have been and number of scientific studies into the potential health effects of exposure to ceramic fibers. Like almost any type of dust Ceramic Fiber has been found in laboratory experiments to be carcinogenic if exposure is very high over a very long period of time. These laboratory findings from the 1980's are often quoted by competing manufactures to highlight potential issues even though more recent real world testing shows that “there is no evidence of an effect of cumulative exposure to ceramic fibers”\(^2\). This study looked at workers in European plants that had been making Ceramic Fibers for the past 25 years and tracked any health issues in the workers vs the normal population. The report concluded that even those workers who were exposed to Ceramic Fibers at a much higher concentration than end users showed no significant increase in lung related health issues.

For an end user of Woodrow Kilns the exposure to stray Ceramic Fibers is also decreased by the use of Omega refractory spray on coatings. These coatings help seal the Ceramic Fiber insulation and stiffen the board to help with impacts. This coating has a reflective component which helps to increase the efficiency of the board as an insulator.

Woodrow’s recommended procedure when dealing with any type of dust within your Kiln is to use a suitable P1 dusk mask. Any dust can cause irritation, be it ceramic fibre or dust from fired clay. If any irritation does occur please wash the area and seek medical advice.

By Adam Crozier
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Woodrow Kilns Pty Ltd

Footnotes:
1. "How Effective are Insulating Refractory (Ceramic) Fibers” Author: Dr Abhijit Joardar
   Published: [http://viewforyou.blogspot.com/2010/04/how-effective-are-insulating-refractory.html](http://viewforyou.blogspot.com/2010/04/how-effective-are-insulating-refractory.html)

2. “Are the respiratory health effects found in manufacturers of ceramic fibres due to the dust rather than the exposure to fibres?”